The importance of education aid for primary, secondary and tertiary educational outcomes.

This study adds to the existing literature by studying the relationship between education aid and educational outcomes in developing countries. Using the most recent and complete data on aid disbursements, aid for education is further disaggregated to aid for primary, - secondary and higher education. The results obtained indicate that aid has a positive effect on primary- and secondary educational outcomes. The effect of aid for higher education on tertiary enrolment rates is not significant and not robust for various specifications. Furthermore, the results suggest that aid for primary education yields the highest returns when it is donated to low-income countries. Aid for higher education achieves the greatest effect when it is donated to lower-middle-income countries. Due to missing data for educational outcomes and a limitation in the years covered by the data panel, the results are only considered as an indication of the possible impact of aid for education.

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1. Introduction

With the aim of contributing to economic growth in developing countries, donor countries offer large amounts of foreign aid. Despite the many studies that have been carried out to measure the actual impact of foreign aid, no consensus has yet been reached on this. These studies show mixed results and the extent to which aid leads to economic growth is still controversial.

The controversy over the effect of aid was highly present from the second half of the 20th century. In recent years there has been a tendency in which studies prove the positive effects of aid conditional on the more structural characteristics of the recipient country (Dalgaard, Hansen and Tarp, 2004). Hansen and Tarp (2000) outline the progress made in the aid effectiveness literature that contributed to this development. The first-generation of authors focussed on the effect of foreign aid on savings. The second-generation concentrated on the effect of aid on economic growth by studying the effect on investments, resulting in a positive impact. Authors from both generations found results that showed that increased savings lead to higher investments and consequently to higher economic growth rates (Solow, 1956). At last, the authors of the third generation took the importance of the political and institutional environment of the recipient country into their studies. In addition, endogeneity issues and nonlinear relationships are recognised. In general, the results point to a significant positive effect of aid on growth, both conditional and unconditional on political characteristics. Burnside and Dollar (2000) were frontrunners in studying the conditionalities on which aid should be provided and showed the importance of the political context of the recipient country. Other research points out to the importance of democracy, tropical climate, social capital and institutional quality (Miller, 2012). The influence of such studies is evident as they are often a basis for policy recommendations. The results of the working paper of Burnside and Dollar (1997) were for example used in the World Bank policy research report (World Bank, 1998).

Still, many studies emphasise the negative and low/insignificant results from aid effectiveness studies. Even review studies do not agree on the effect of aid on economic growth. For example, Hansen and Tarp (2000) found an average positive effect of aid on growth, while Bourguignon & Sundberg (2007) concluded on the basis of 97 studies that there is on average a positive but insignificant effect of aid on growth. An essential feature of the earlier literature can explain some of the ambiguous results found when studying the broad question; ‘What is the impact of aid on economic growth?’ Namely, the focus on aggregated aid flows.

Because of the heterogeneous nature of foreign aid, it is not surprising to find a small or even no effect when aggregated aid flows are studied. Aid is not only altered to enhance economic growth but can improve different types of situations in a country. Aggregated aid flows, for example, also include disaster relief and aid for humanitarian purposes. When these diverse motives are not taken into account it can be difficult to unravel potential effects. Studying disaggregated aid flows, like aid purposed for the healthcare sector, the energy sector or education can overcome this inconsistency. Because the first data on disaggregated aid flows have only been available since the 1970s, these studies have only recently become possible.

This new focus in the literature has led to many studies looking at the effect of disaggregated aid flows on growth and other determinants. This shift was also caused by another important event which led to a rapid increase in the amounts of aid given to developing countries. During the Millennium Summit of the United Nations in 2000, the developed world agreed on the establishment of the Millennium Development Goals (MDGs). These goals resulted in an increased focus on the effect of aid on human development and poverty reduction instead of only economic growth (De Matteis, 2013). This focus gained strength when more than 100 countries signed The March 2005 Paris Declaration on Aid Effectiveness in which countries agreed on providing more ownership and coordination to recipient countries by making the switch from project-based aid to programme-based aid like general budget support (Leiderer, 2012).

One of the MDGs that reached much attention was the second goal which ensures universal primary education in 2015. MDG2 is specified as follows: '*To ensure that children universally – including both boys and girls – will be able to complete a full course of primary education.'* Even before the MDGs the World Bank already established the Education for All (EFA) campaign in 1990 (UNESCO, 2007). These two events made the improvement of education in developing countries an essential topic for donor countries. A rapid increase in education aid followed (OECD, 2016).

This focus has led to many studies that followed the path of the traditional aid literature and explored the impact of aid for education on economic growth. Another path that is followed by only a handful of researchers is the focus on the effect of educational help on educational outcomes, which shortens the chain of causality. The study carried out in this thesis follows the second path and adds to the existing literature by studying the relationship between education aid and educational outcomes. Previous studies were followed with the contribution of using improved data on the disbursement of education aid and a further breakdown of aid

into aid for primary, - secondary - and tertiary education. The results indicate an average positive effect of educational assistance on educational results and thus confirm the results from previous studies.

In chapter 2 the existing literature is discussed as well as the relevance of the subject. Chapter 3 follows with an explanation of the data used and show some descriptive statistics to give a first insight into the relation between education aid and schooling outcomes. Chapter 4 outlines the estimation strategy used to uncover the potential contribution of aid of which the results are discussed in chapter 5. The study ends with a conclusion and discussion of the results.

2. Literature review

2.1 Relevance

Despite the ambiguity on the effect of aid on economic development it is essential to keep improving the studies researching this effect. Theory predicts the importance of aid which is often confirmed by the results from micro-studies (see for example; Duflo, 2001 and Banerjee et al., 2007). Sachs (2005) calls for more aid based on the arguments of the poverty trap and the financial trap. He argues that the extremely poor have no assets to save and invest and by that do not have the means to accumulate their capital to ensure higher returns in the future. The second factor shaping a country's economic development is the financial trap outlining the lack of resources governments face supplying infrastructures like roads, schools and healthcare. Investments in education and health are essential to improve the stock of human capital. Lastly, foreign aid can be accompanied by a knowledge transfer from developed to developing countries. These main reasons discussed by Sachs (2005) outline the importance of foreign aid for the development of a country. Following his reasoning, an increase of education aid should help a country to overcome the poverty- and financial trap leading to better public infrastructure and the ability of families to invest in the education of their children. Subsequently, education aid can help countries to reach the second MDG, but also fulfil the right of people to go to school.

As stated in the introduction, recently a switch has taken place in the aid effectiveness debate to the measurement of the effect of disaggregated aid flows, including aid flows for educational purposes. Already before the start of the EFA campaign multilateral and bilateral development organisations interfere with educational policies in developing countries. However, the change in focus caused by EFA led to a change in the way organisations think

about how to give aid effectively. A consensus emerged on priorities for international development. The two most important priorities are universal access to primary education and gender equality in education. Regarding enrolment into primary education, parity between boys and girls is improving. However, the UN states that women still face discrimination in access to education. Especially for secondary- and tertiary education parity between boys and girls is lacking behind (UN, 2012).
These priorities led to an increase in aid for education since 1995 and new actors providing aid (e.g. NGOs and private organisations) (Mundy, 2006). It is important to study if the extra effort taken by donor countries is leading to the desired effect.

The literature studying the effect of education aid is divided into two groups, the first one looks at the effect on economic growth and the second one looks at educational outcomes. Studies looking at economic growth substantiate their relevance as education is seen as an important factor that contributes to economic growth. For example, the importance of education in increasing labour productivity and wages (Robeyns, 2006). The second group looks at educational outcomes as a development goal on its own. Universal education is not only stipulated in the second MDG, but the importance of education is officially acknowledged when it was declared as a human right in the Universal Declaration on Human Rights in 1948. Besides that, educational outcomes are not only of importance for welfare effects and by that a goal in itself; it subsequently can enhance economic growth as is shown by Hanushek & Wößmann (2007).

2.2. Overview of the literature

The attention that the second MDG achieved caused most studies to focus on the effect of education aid on primary enrolment rates or on economic growth. As the effect of aid on economic growth is with no-doubt of value, it is interesting and useful to shorten the chain of causality and focus on the more direct impacts of foreign aid. Studies choosing this approach followed the outcomes determined in the MDGs as for MDG2 the enrolment into primary education.

The choice of MDG2 and most studies to focus only on primary education is criticised (Heyneman & Lee, 2016). First, not only primary education contributes to human capital and economic development, but also secondary and higher education plays an important role. There is also evidence that investments in higher education positively improve the quality of primary and secondary education (Heyneman, 2009). Michaelowa and Weber (2008) are one

of the few that included an analysis of secondary and tertiary education in their study. Based on a long-term panel from 1975 to 2000 and a short-term panel from 1993 to 2004 they look at the effect of commitments of education aid on primary-, secondary- and tertiary educational outcomes. For all three levels of education, they find a significant, though low effect of aid on educational outcomes. Extending the panel constructed by Michaelowa and Weber (2008) can be of value as it is possible that in recent years the role of secondary- and tertiary education has become more prominent possibly yielding higher results than predicted by Michaelowa and Weber (2008).

A second reason why it is useful to focus on secondary- and tertiary education is the possible heterogeneity of aid and the recipient countries. Asiedu and Nandwa (2007) found that for low-income countries investment in primary education is most beneficial for economic growth as for middle-income countries it is best to invest in secondary education. They interpret this finding based on the theory that the abilities of a country are of influence on positively translating educational achievement into economic growth. Technical and physical know-how adds to a country's ability of which the availability depends on the economic development of a country. Also, for policy reasons, it is essential to know which countries should receive investments in primary education and for which countries higher education is a priority. Besides the study of Asiedu and Nandwa (2007) who look at economic growth, no study is found to include the heterogeneity of aid and the recipients in assessing the effect of education aid on educational outcomes. Nevertheless, it can be of value to include this aspect in the study because evidence shows a negative relationship between poverty and school attendance. Using household surveys to assess the interrelation between household wealth and school attendance studies find wealth-based inequalities in school attendance. Programs eliminating wealth inequalities, by for example providing school uniforms or meals, saw an increase in enrolment rates (Education Policy and Data Center, 2008).

Another consequence of MDG2 is the focus on enrolment rates, and to a lesser extent, completion rates. Michaelowa and Weber (2007) were one of the first studying the effect of education aid on educational outcomes and found a small effect on primary enrolment and completion rates. The effects were higher for countries with a system of good governance. Dreher et al. (2006) as well look at educational outcomes, namely primary enrolment rates, and analyse a data panel from 1970 to 2004 of low- and middle-income countries using 5-year averages. They find a stronger positive effect than Michaelowa and Weber (2007), which can

be explained by the estimation strategy as Michaelowa and Weber (2007) analyse annual improvements.

Looking at enrolment rates is in line with the MDG2 as it states enrolment as their primary objective, though is less informative as it does not include drop-out rates which can be high as well. For that reason, completion rates, as is used by Michaelowa and Weber (2007), is preferable. However, enrolment and completion rates only assess the number of children that start school subsequently finish school. It is ideal to study the effectiveness of education aid on the quality of education. For example, research shows that children completing primary school are still not literate. Besides that, an increase in enrolment rates can even worsen the quality of education (Clemens, 2004). Unfortunately, data availability on appropriate proxies for quality, for example, international comparable test scores, restricts such an analysis. Especially for developing countries, which are significant receivers of education aid, such qualitative statistics are lacking.
Nevertheless, a handful of studies tried to measure the quality of educational systems. D'Aiglepierre and Wagner (2013) use repetition rates and pupil-teacher ratios. However, Birchler and Michaelowa (2016) question the suitability of these proxies because the correlation with student achievement is weak. Wolf (2007) use youth literacy rates, again Birchler and Michaelowa (2016) question this measure as literacy can be obtained outside the school as well. Birchler and Michaelowa (2016) belong to one of the few that try to assess educational quality. Using Development Assistance Committee (DAC) disbursement data they look at the effect on primary educational outcomes. The most suitable measure of quality they propose is the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEQ). Unfortunately, the SACMEQ is very limited as well and does only include few data points. As far as they were able to measure quality, they find that education aid is more beneficial for increasing enrolment rates than improving the quality of education. Besides this extension, they also focus on the effect of aid purposed for secondary- and tertiary education on primary educational outcomes. They find a modest effect of education aid for primary education on primary enrolment rates and a modest interaction effect of aid for primary and secondary education on primary enrolment rates. The effect of aid on secondary- and tertiary educational outcomes is not included in their study.

An important aspect that can influence the results of most studies that is worth mentioning is the fungibility of aid. The fungibility of aid means that recipient countries spent a part of aid on other purposes than for which the donor countries provided aid. If this is the case the actual

amount of aid spent on education is lower than the data assumes. Fortunately, Van de Sijpe (2012) provide recent evidence suggesting that the fungibility of aid in the education sector is limited. Morrissey (2015) as well concludes that there is no evidence that the fungibility of aid is a severe problem that affects the effectiveness of aid. Based on the recent evidence I assume that the fungibility of aid will not severely bias the results.

As discussed, some work has been done studying the effect of education aid. Most of the papers focus on primary educational outcomes, namely enrolment and completion rates. The study conducted in this thesis will follow the earlier papers on several grounds and will subsequently extend the analysis. Unlike earlier studies, this study will solely make use of disbursement data. Only Birchler and Michaelowa (2016) were able to make use of the more preferred disbursement data as well. Because reliable data of disbursements is only available from 2002, the data panel covers the years 2002-2016. This period overlaps with the start of the influence of MDG2 and the increase in aid for education. This study measures the effect of education aid on enrolment and completion rates separately for primary-, secondary- and tertiary education and if there is a different effect for diverse states of development. To increase the comparability with earlier studies and to see whether the use of newer data and a further disaggregation of aid alters the results, previous studies are followed in the methodology and data used.

3. Data

The dataset constructed for the analysis exists of several dependent variables, independent variables and control variables which are all explained in this chapter. Before discussing the data and their sources, an explanation of the countries selected in the sample is given.

3.1 Country selection

Countries classified as low- and lower-middle-income countries, based on the definition of the World Bank (2015) using the World Bank Atlas Method, are included in the data sample. Low-income countries have a GNI per capita of $1,045 or less and lower-middle income countries between $1,046 and $4,125. The analysis does not include upper-middle-income countries and high-income countries as most of these countries already achieved enrolment and completion rates of 100 per cent.

The increase of education aid was partly a consequence of the EFA campaign. Based on the goals of this campaign an index is created, the EFA Development Index (EDI), to indicate to

which extent countries reached the fulfilment of the EFA goals. An assigned score of >0.95 indicates that the country fulfilled most of the goals. The index is constructed based on the progress made in different components, namely the primary net enrolment ratio, adult literacy rate, survival rate to grade 5 (which is a proxy for the quality of education as no better measure is available) and a measure combining gender parity and gender equality. The index assigned in the year 2012 is used to analyse if the countries classified as low- and lower-middle-income countries are indeed the countries in need of education aid. The year 2012 is chosen as the available indexes for the other years are incomplete. The low- and lower-middle-income countries selected for this study almost all have an index below 0.95 which means they did not fulfilled the MDG2 and are indeed in need for education aid. Upper-middle-income countries and high-income countries all have a score of almost 0.95 or higher. Besides this list, Georgia is included in the sample because it only has the classification of upper-middle-income country since 2015.

For a subset of countries, no adequate data on educational outcomes is available. For that reason, the following countries are not included in the country selection; The Democratic Republic of Korea, Kosovo, South Sudan, Guinea-Bissau and Haiti. The list of countries included in the analysis consists of 79 countries and is found back in the appendix.

To assess whether less developed countries face more difficulties in increasing enrolment and completion rates than relatively better-developed countries, the full sample of countries is used to estimate the effect of aid as well a split sample.

3.2 Education aid

Following Birchler and Michaelowa (2016) the explanatory variable of interest is total aid disbursement for the educational sector, measured in constant dollars to account for exchange rate fluctuations and inflation. To take into account that larger countries need more resources to increase educational attainment relative to smaller countries the variable is measured per capita (Dreher et al., 2008; Birchler and Michaelowa, 2016). As a robustness check aid is divided by the total population that is younger than 15 years to account for the share of the population for which education aid is intended.

The data is made available by the Organisation for Economic Co-operation and Development (OECD) Creditor Reporting System (CRS). The data contains disbursements on Official Development Assistance (ODA). The database is one of the most comprehensive ones in tracking aid data, and most studies measuring disaggregated aid flows use the CRS data set.

Since 1960 it keeps records on aggregated data and since 1990 disaggregated data flows are reported. It is preferred to use disbursement data over commitment data. Michaelowa and Weber (2007) consider commitment data as an imprecise predictor of final aid flows, and only disbursements can lead to effective outcomes as it is unclear when and if donor countries disburse commitments to the recipient country (Gehring, Michaelowa, Dreher, & Spörri, 2015).

The most reliable data on disbursement for education aid reported by the DAC statistics are only available from 2002. The data on disbursements from before 2002 is incomplete as the coverage ratio is under 60 per cent. From 2002 onwards, the coverage ratio is around or over 90 per cent and it reached 100 per cent from 2007. It is discouraged to use disbursements data prior to 2002 (OECD, 2018) and for this reason, the analysis starts from 2002. For earlier studies, it was not sufficient to use this timeframe. For example, Birchler and Michaelowa (2016) could not exclusively use this preferred data because this would yield a data panel with not enough observations.

Total aid for education is subdivided into aid specifically for primary, secondary- and higher education. As is suggested by Michaelowa & Weber (2007) this subdivision is used in the study to measure the effect of aid for all educational levels separately. These three types are part of a broader category. Besides aid for primary education, aid for basic education includes aid for basic life skills for youth and adults and aid for early education. Total aid for secondary education also includes aid for vocational training and post-secondary education also includes aid for advanced technical and managerial training. These three broader types of aid are used as a robustness check as spillover effects from the broader categories are not unlikely.

Another category is education aid earmarked as aid for which the level of education is unspecified. This category is intended for the three educational levels as well and by that potentially contributes to enrolment and completion rates. To account for this category the advice of the UNESCO-Institute of Statistics is followed (Michaelowa & Weber, 2007). 50 per cent of education aid for which the level is unspecified is added to primary education, 20 per cent to secondary education and 30 per cent to tertiary education. The broader categories are supplemented with the same percentages.

3.3 Educational outcomes

The several dependent variables used in this study are all educational outcomes. Preferably a proxy for educational quality is chosen as the outcome variable. Unfortunately, there is not enough data available for the countries included in the sample. Alternatively, comprehensive data is available on enrolment and completion rates from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics accessible from the World Development Indicators (WDI).

The particular variables used in the analysis are primary- and secondary net enrolment and completion rates and tertiary gross enrolment rates. The net enrolment rate is preferred over the gross enrolment rate because the net rate only includes data on pupils of the appropriate school age. Late enrolment and repetition rates are included in the gross rates which distort the image of the definite increase in enrolment (Michaelowa & Weber, 2007). The completion rates are measured in percentage of the relevant age group.

For several years and countries, data is missing on educational outcomes. Previous papers propose to deal with the data issue by linear imputation using closely related variables, like gross enrolment for net enrolment rates or values of adjacent years (see for example Michaelowa & Weber, 2007; Birchler and Michaelowa, 2016). Linear imputation can indeed increase the amount of observations, nevertheless it is important to substantiate the methodology of this process which aspect is unfortunately neglected in most studies. Despite the disadvantage of fewer observations, it is decided to keep the data original and transparent and to treat missing data as missing values.

3.4 Control variables

To increase the comparability of this study with previous studies, they are followed by the choice in control variables. Primarily the study of Birchler and Michaelowa (2016) is followed, however most studies include comparable variables.

GDP per capita based on purchasing power parity (PPP) (constant 2011 international $), pupil-teacher ratios and the share of the population aged 15 or younger are included as these variables influence the capacity of a country to increase enrolment and completion rates (Birchler and Michaelowa, 2016). It is to be suspected that countries with a higher GDP per capita PPP are more capable of increasing educational attainment because families have more resources available to send their children to school. Having a high share of the population being younger than 15 years old can make it more difficult to increase educational outcomes. When the share of school aged children is higher, there are by definition less adults in the

country capable of earning money. This can lead to fewer resources being available to send children to school. Countries with higher pupil-teacher ratios are suspected to have lower enrolment and completion rates. When classrooms are crowded the change on drop outs is higher and it can deteriorate the quality of education leading to less demand for education (Michaelowa and Weber, 2008). These variables are all collected from the World Bank.

Not included by Birchler and Michaelowa (2016) is the share of the urban population. This variable may affect the capacity of a country to increase educational outcomes. Urbanization rates reflect a country's ability to reach higher enrolment and completion rates, as a significant proportion of children who are not in school live in rural areas (Muro & Burchi, 2007). The variable is included to see whether they indeed capture a part of the effect of the increase in enrolment and completion rates. Another variable that most studies include but is not included by Birchler and Michaelowa (2016) is adult literacy rates. Adult literacy can contribute to parent's expectation of their children's career opportunities (Roberts, 2003). This study omits adult literacy rates from the analyse because of a lack of data and because of the strong correlation with the dependent variables (a correlation of 0.86 with primary completion rates).

Another variable included by most studies is government spending on education as a share of total government expenditure. The data is gathered from the UNESCO Institute for Statistics available from The World Bank EdStats Database. Because general budget support became an important way in providing aid, it is likely that government spending includes some of the aid intended for education. Omitting this variable from the analysis would potentially lead to an underestimation of the amount of aid spent on education. Besides that, the part of government spending that not consists of aid is likely to influence educational outcomes as well. On the other hand, it might be possible that the same flow of money is accounted for in education aid as well as in government spending on education. In this case a part of aid is accounted for twice in the analysis which would make the exclusion of the variable preferable, particularly because many studies find no effect of government spending on educational outcomes (see for example the study of d'Aiglepierre and Wagner, 2013 and Birchler and Michaelowa, 2016). Despite these results, the literature regards government spending as an essential control variable. For this reason, government spending is included as a robustness check to control for possible omitted variables bias and to make the comparison with other studies more convenient.

Initial completion- and enrolment levels are included on the right-hand side of the equation to consider that is easier to reach higher enrolment- and completion rates when in previous years

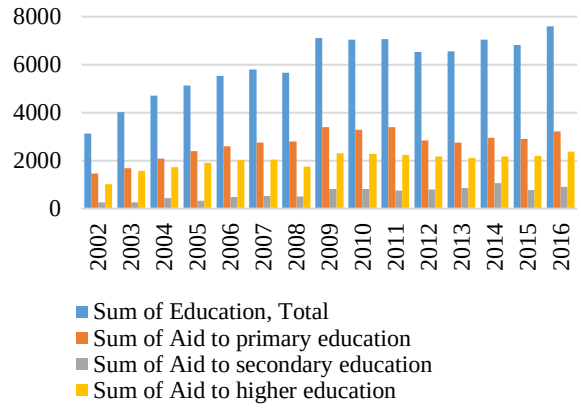
the rates already reached a certain level (Birchler and Michaelowa, 2016; Michaelowa & Weber, 2004). Earlier studies found highly significant coefficients of this control variable.

Many studies account for the conditionality of aid effectiveness on the political and institutional context of the recipient country. The study of Burnside and Dollar (2000) is followed by including several proxies to control for economic and political governance. More specifically, the budget surplus or deficit, inflation, openness to trade and an indication of a countries democratic freedom proxied by the average of the Freedom House Index of political rights and civil liberties (Birchler and Michaelowa, 2016). The Freedom House Index bases its index of political rights and civil liberties on the characteristics discussed in the Universal Declaration of Human Rights, adopted by the UN General Assembly in 1948. The index assigns an average score including both political rights and civil liberties. Based on their score countries are divided into the following categories; Free (1.0 to 2.5), Partly Free (3.0 to 5.0) or Not Free (5.5 to 7.0). Additional, a possible non-linear effect of aid is taken into account as previous literature shows diminishing returns of aid (Michaelowa & Weber, 2007).

3.5 Descriptive Statistics

Before conducting the econometric analysis, descriptive statistics can give us a first glance at the data.

Figure 1 - Sum of education aid, sample total



Aid disbursements measured in million $ (constant, 2016). *Source: OECD DAC CRS and WDI, World Bank (2017).*

As we can see from the first graph, the highest share of education aid is intended for primary education, followed by higher- and secondary education. This is in line with the focus on primary education established by EFA and MDG2. On average there is a rise in aid disbursements over the sample period.

Figure 2 - Primary education, low-income

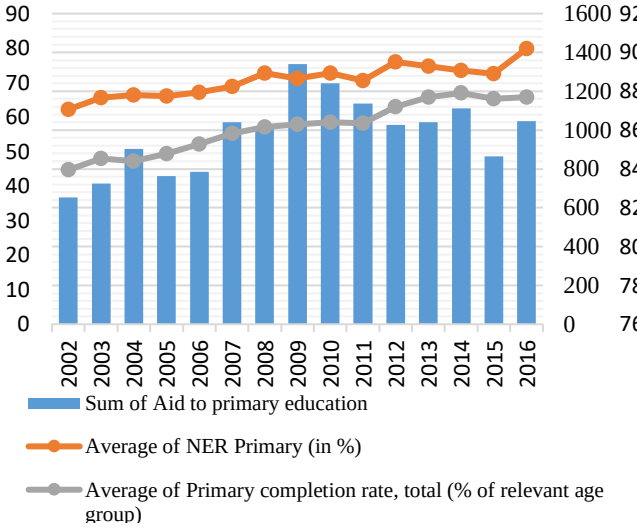
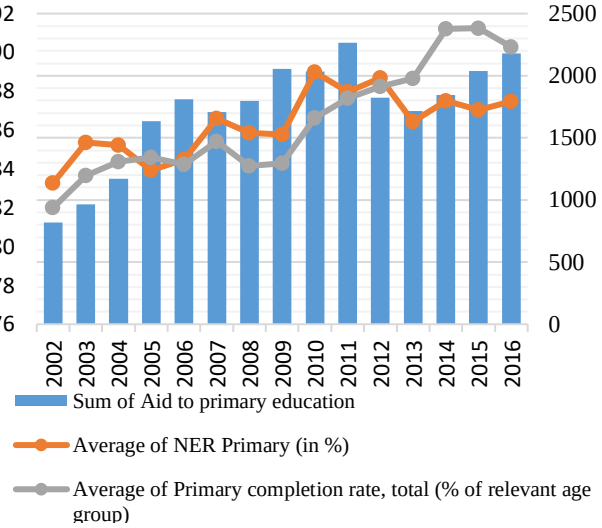


Figure 3 - Primary education, lower-middle-income



Aid disbursements measured in million $ (constant, 2016). *Source: OECD DAC CRS and WDI, World Bank (2017).*

Figure 2 shows the trend of the sum of aid to primary education and the averages of the net enrolment and completion rates for low-income countries. Figure 3 shows the same variables for lower-middle-income countries. The sample is split between low- and lower-middle-income countries to give a clear overview of the differences between these two groups. Over the sample period, the net enrolment rate increased from approximately 60 per cent to 80 per cent in low-income countries. Completion saw an increase of the same magnitude from approximately 45 per cent to 65 per cent. Aid to primary education increased over the same period as well which is supporting for the research question that aid for primary education positively affects educational outcomes. In lower-middle-income countries, the starting rates of the educational outcomes are higher than in low-income countries and completion rates are closer to enrolment rates. The net enrolment rate increased from 83 to 85 per cent and completion from 82 to 89 per cent. The improvement over the sample period is much smaller than for low-income countries which substantiate the hypothesis that for countries with higher starting rates it is challenging to increase educational outcomes. Overall, both educational aid and educational outcomes increased over the period for both income groups.

Figure 4 shows the results for secondary education in low-income countries. Again, aid flows increased and educational outcomes almost doubled. After 2013 aid disbursement, as well as educational outcomes, decreased slightly. The progress made in lower-income countries concerning secondary education is somewhat larger than the progress made for primary education, despite the lower amount of aid received. However, the starting values for secondary education are much lower which again substantiate the hypothesis that if starting

values are low, it is easier to increase the enrolment or completion rate. The same reasoning applies to lower-middle-income countries.

Figure 4 - Secondary education, low-income

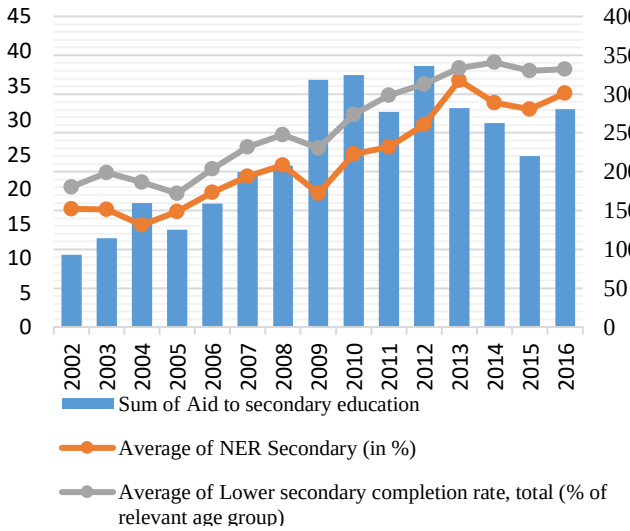
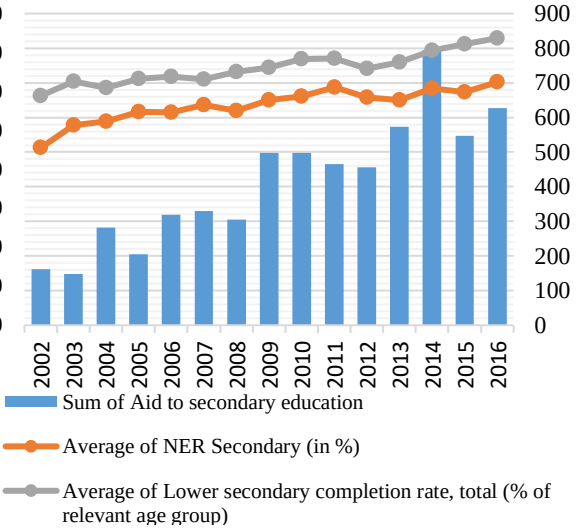


Figure 5 - Secondary education, lower-middle-income



Aid disbursements measured in million $ (constant, 2016). *Source: OECD DAC CRS and WDI, World Bank (2017).*

In figure 6 and 7 the same trend is seen for higher education. The average gross enrolment rate for low-income countries just reached 2 per cent in 2002 and went up to almost 9 per cent in 2016. Lower-middle-income countries saw an increase from 15 per cent to almost 30 per cent. As is seen in the first graph, the share of aid disbursed to tertiary education is larger than to secondary education which could explain the higher rise in educational outcomes. Again, the starting rates are lower as well which can also explain the high increase.

Figure 6 - Higher education, low-income

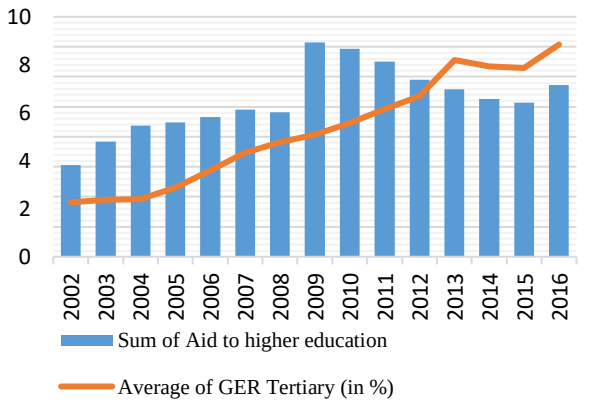
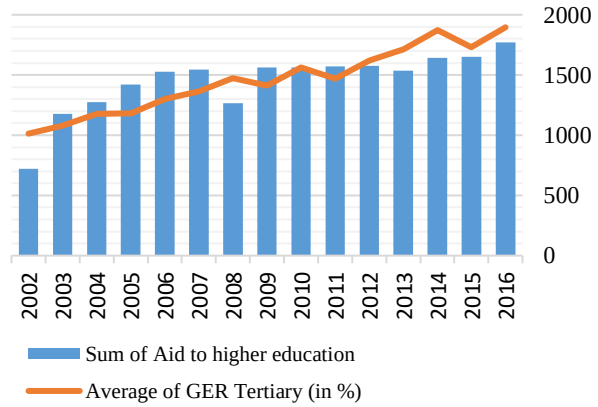


Figure 7 - Higher education, lower-middle income



Aid disbursements measured in million $ (constant, 2016). *Source: OECD DAC CRS and WDI, World Bank (2017).*

The differences seen between low- and lower-middle-income countries emphasise the importance of the research which type of aid is most beneficial for which countries, depending on the state of development. It may be expected that for both low- and lower-middle-income countries it is easier to increase educational attainment for secondary- and higher education than it is for primary education, because the initial values are lower.

These simple statistics provide the first direction into which the analysis can proceed, namely a positive relationship between education aid and educational outcomes. This relationship is in line with the results found by most of the studies discussed in the literature review. Nevertheless, the graphs ignore endogeneity issues and cannot be interpreted as a causal relationship. To control for these issues more enhanced econometric analysis is conducted in the next chapters.

4. Methodology

This study measures the effect of education aid on educational outcomes by carrying out a panel analysis covering the years 2002-2016. The first results are obtained by estimating a fixed effect model. The baseline estimation equation is specified as follows:

$$(1)\ Educ_{it} = \beta_0 + \beta_1 \ln(Aid_{it}) + \beta_2 \ln(Aid_{it-1}) + \beta_3\, Educ_{it-1} + \beta_4 X_{it} + \alpha_i + \alpha_t + \varepsilon_{it}$$

The variable of interest, education aid per capita for country *i* in year *t*, appears in several forms. Namely, aid for primary education, for secondary education and higher education. It is suspected that education aid positively affects the outcome variables because it contributes to country's financial abilities to increase educational attainment. Education aid is measured in natural logarithms, so the results are interpreted as semi-elasticities. Additionally, the lag of education aid is included since it is likely that aid granted in one year also affects the outcome variables in the year after. It is expected that aid does not affect the completion percentages in the same year because there are several years between the enrolment of a pupil at school and its completion.

The outcome variable takes several forms as well. The primary variables of interest are primary and lower-secondary completion rates and primary and secondary net enrolment rates and tertiary gross enrolment rates for country *i* in year *t*. The lag of the outcome variable is added on the right-hand side of the equation to control for the difficulties countries may face increasing their educational outcome when in the previous years they already achieved higher rates.

The vector X consists of the several control variables discussed in the data section. Beside the control variables, the specifications are estimated including a squared aid term to account for potential non-linearities. Additionally, an interaction term between aid and the Freedom House Index, which is proposed by the study of Burnside and Dollar (2000), is included. At last i and t presents country and year dummies and ε_{it} the error term.

The regression equation is estimated using different data samples. First, all countries are included. Secondly, the sample is divided between countries with a low- or lower-middle-income to study whether the effectiveness of the different sectors of education support depends on the state of development of a country.

As is discussed in the data section, the data suffers from the limitation of missing values. To analyse the data with as many observations as possible the first regressions use annual observations. Annual observations are not ideal to show the impact of more structural variables (Michaelowa & Weber, 2007). It may be expected that the outcome variables need some time to react to the increase or decrease in aid. If, for example, aid is used to built schools, the effect on enrolment rates becomes only visible when the school is ready and can accept new students. To take into account the time required for educational performance to adapt to the amount of aid received, 3-year averages are calculated for all the explanatory variables. These averages result in the following five periods, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-216, which are all related to the dependent variable at the end of each period. The estimation equation looks as follows:

$$(2)\ Educ_{it} = \beta_0 + \beta_1 \frac{1}{3}\sum_{k=0}^{2} Aid_{it-k} + \beta_2 \frac{1}{3}\sum_{k=0}^{2} Educ_{it-k} + \beta_3 \frac{1}{3}\sum_{k=0}^{2} X_{it-k} + \alpha_i + \alpha_t + \varepsilon_{it}$$

It is difficult to determine how many years countries need to turn the aid received into an improvement of their educational performance. For example, the countries included in the sample all have different school systems that differ in the number of years pupils attend primary school. To maintain sufficient observations for the econometric analysis, the 3-year averages are chosen similar to d'Aiglepierre & Wagner (2013).

The results from the fixed effect model are interpreted with caution. The model does account for variables that are country-specific and do not change over time, like culture or colonial history and control for variables constant between countries that do change over time. For example, characteristics of the donor countries that affect the support to the countries in the

sample. However, the results are potentially biased because of (un)observed factors not captured by the control variables or fixed effects.

A second potential concern that cannot be solved with a fixed effect model is that of reverse causality. Mostly aid is provided to the developing countries with the lowest enrolment rates leading to a downward bias of the estimates (Dreher, Nunnenkamp, & Thiele, 2006). A downwards bias is less of a problem as the results can be interpreted as a lower bound of the true effect. Nevertheless, it is essential to correct for this problem as it can distort the outcomes. In the literature, several methods are proposed to control for endogeneity issues. An ideal method would be the introduction of an instrument which is done by some studies that establish the effect of education aid on educational outcomes. An often-used instrument is energy aid and another proposed instrument is health aid. However, controversy exists over the use of these instruments as they have a weak first stage and it is difficult to defend that they are not correlated with the error term. There is a consensus that health aid is not exogenous because it directly influences educational outcomes. Some papers, like the one from Michaelowa & Weber (2007) defend that energy aid is exogenous with the only problem of a weak first stage. They conduct a 2SLS analysis using energy aid as an instrument and find a stronger effect of aid on educational outcomes than when they do not include the instrument. However, this method is not suitable as it is not difficult to think of reasons why energy aid cannot be regarded as exogenous. The availability of energy influences people's living conditions and standards which can be part of parent's decision to send their children to school. Besides that, if school buildings are lighted with electricity this can for example reduce drop-out rates and increasing completion rates. Birchler and Michaelowa (2016) acknowledge that energy aid is not suitable, especially not for the more recent disbursement data. For these reasons, and for the unavailability of other valid instruments, this study follows the reasoning of Birchler and Michaelowa (2016) and does not include the instruments proposed in the previous literature regarding the effect of education aid on educational outcomes.

Because of the lack of a suitable instrument, another method used by most of the aid effectiveness literature is applied. Among others, Michaelowa and Weber (2007), Dreher et al. (2008) and Birchler and Michaelowa (2016) try to control for endogeneity issues using a system of Generalised Method of Moments (GMM) dynamic panel model, proposed by Blundell and Bond (1998). The use of system GMM assumes to solve several issues. As said, it partly corrects for the problem that aid is considered endogenous. Besides that, government

expenditure is considered endogenous as well. The model includes the lagged differences and levels of the explanatory variable as its instrument.
The use of this method has several advantages and disadvantages. There is a strong relationship between the explanatory variable and its lagged value. However, the validity of the instruments is questioned. If educational outcomes influence the incoming amount of aid, the lagged value of educational outcomes will influence the lag of aid received. Subsequently, current educational outcomes influence lagged aid because educational outcomes are assumed to be autocorrelated over time (Birchler and Michaelowa, 2016; Michaelowa and Weber, 2007). Another disadvantage is that authors encounter the problem that the models do not present robust results when different specifications are used (Michaelowa and Weber, 2007).

Even though the system GMM does not entirely circumvent the endogeneity issues, the model is used to instrument education aid, lagged educational outcomes and government expenditure on education. The results are compared to the results obtained with the fixed effect model to assess whether a part of the bias is solved. As mentioned before, it is preferred to solve the problem of reverse causality by using an appropriate instrument. However, it is expected that the issue results in a downward bias of the effect of aid on educational outcomes which make the issue less severe.

At last, several robustness checks are performed. Firstly, aid for basic-, total secondary-, and post-secondary education are used as the explanatory variables of interest. These types of aid can affect the results because the different nature of purposes can influence the educational outcomes. For example, aid for early education and aid for basic life skills can stimulate the choice of parents to send their children to primary school. Secondly, aid is not measured per capita but divided by the total population younger than 15 years old and GDP per capita is included instead of GDP per capita PPP. The specifications are also estimated with and without government expenditure on education.

5. Results

In the first part of this section the estimated effect of aid and lagged aid on the outcome variables are discussed separately for primary-, secondary- and tertiary education. The specifications are estimated using a fixed effect model with annual observations and a structural panel with averages over 3 years. Lastly, system GMM is used to control for potential endogeneity issues. Based on these results the preferred specifications are chosen for which the robustness checks are performed.

5.1 Primary education

The first table contains the results of the estimated effect of primary education aid on primary net enrolment rates and primary completion rates. First, the results of the fixed effect model are discussed followed by a discussion of the results from the system GMM.[1] All the control variables discussed in the data section are included. Results are found back in the appendix.

Table 1 – Primary education

	FE: Annual observations 2002-2016		**FE: 3-year averages**		**System GMM (annual observations)**	
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Aid primary per capita	0.8930*	-1.9861***	1.0377**	0.1251	0.1622	-1.1566
	(0.4486)	(0.6382)	(0.4345)	(0.5681)	(0.5630)	(0.8514)
Ln lag Aid primary per capita	-0.4371	2.2499***			-0.3853	2.6060***
	(0.4979)	(0.8013)			(0.5782)	(0.8025)
Adjusted R2	0.733	0.692	0.905	0.925		
AR(2) (Prob > z)					0.7424	0.7130
Sargan (Prob > chi2)					0.1902	0.1279
Observations	222	243	110	127	222	243
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) and (6). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (3) and (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (5) and (6) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

The first specification estimates a positive effect of aid for primary education on net enrolment rates in the same year. The effect is higher when the results are based on the structural panel.[2] When the results are interpreted, it is important to note that the structural panel has lost half of its observations, which is why more caution is required. For completion rates, the results are the opposite. Aid negatively influence completion rates in the same year but has a positive effect on completion in the following year. This outcome is not surprising as it is reasonable to assume that aid has a middle- to long-run effect on completion rates. Children need on average five to six years to complete primary school. Aid donated in one

[1] Based on the results of a Hausman test it is decided that the fixed effect model is most appropriate. The null hypothesis is rejected with a p-value of 0.000 in favor of the alternative hypothesis to use a fixed effect model.
[2] As a robustness check the model is estimated using 5-year averages. The results are somewhat stronger compared to the results when 3-year averages are used. Because of the loss of periods and observations the model with 3-year averages is preferred.

year is likely to benefit children who only graduate some years later. This reasoning is also in line with the positive coefficient on aid in the structural panel.

The results for the control variables can be found in the appendix. These results are not the focus of this thesis. However, it is still of value to discuss them briefly.
The lag value of the dependent variable has a significant effect in every specification. In line with the expectations, it is easier to reach higher enrolment and completion rates for countries where the starting point already reflected higher educational outcomes. The effect of the share of the urban population is only significant in the fixed effect analysis using annual observations. The positive effect is in line with the idea that it is easier or more common in urban areas to send children to school. The coefficient of the student-teacher ratio is positive and significant in some specifications, while a negative effect is expected. When the classroom becomes full, the quality of education is expected to deteriorate and the perceived gains from education decrease. However, it may be that these characteristics are less important in countries with a low- or lower-middle-income. The other control variables are mostly insignificant.

The results estimated by the fixed effect model can only be interpreted as a first indication of the possible effect of aid. As explained in the methodology, the results cannot be interpreted as causal because of the assumed endogeneity of aid. To solve the endogeneity issues which are encountered performing fixed effect models, system GMM is applied. System GMM considers aid as endogenous and includes the lag of this variable as instrument in the specifications. Additionally, system GMM is suitable when the dependent variable depends on its past realisations and also includes the lag of the dependent variable as an instrument (Roodman, 2009).

To test whether the specifications are estimated correctly, the Sargan test for overidentifying restrictions and a test on the existence of autocorrelation are performed and included in the tables. When one lag is included as an instrument the test statistics confirm the validity of the use of system GMM.[3] The null-hypothesis of no autocorrelation in the first-differenced error terms of order two cannot be rejected which means the instruments are valid.[4] In addition, the null-hypothesis that the overidentifying restrictions are valid cannot be rejected. When the number of instruments becomes too high relative to the number of observations, the use of

[3] Similar results are obtained when two and three lags are included as an instrument.
[4] For third- and fourth order correlation the same test is performed for which the null hypothesis cannot be rejected as well.

system GMM can report invalid results (Roodman, 2009a). To prevent this problem, system GMM is not performed using the structural panel to ensure that the results are based on a sufficient number of observations. Moreover, only the first lag is included as an instrument.

Specifications (5) and (6) confirm the results obtained from the fixed effect model. The effect of aid in the same year decreases in magnitude and becomes insignificant but does not switch sign. The effect of aid in the previous year stays stable both for enrolment and completion rates. Because the coefficients do not increase in size, the results of the fixed effect model probably do not suffer from a severe deviation caused by reverse causality. When system GMM is used, most of the coefficients of the control variables lose their meaning. Except the lag of the dependent variable.

At last, the specifications estimated based on annual observations are again estimated, but only with the lag of aid as an explanatory variable of interest. Because it is reasonable to expect that the lag of aid is most useful in increasing educational outcomes, the results may well be closer to the structural panel's estimate by adding only the lag of aid to the model. Nevertheless, the results are comparable to the results obtained when both aid and the lag of aid are included. Using the fixed effect model the magnitude of the coefficients on lag aid becomes somewhat smaller. Using system GMM, the effect of the lag of aid increases in magnitude. The results are found back in the appendix.

The outcomes are in line with previous studies that found a modest but positive effect of primary education aid on enrolment and completion rates and insignificant results for most of the control variables (see for example Birchler and Michaelowa, 2016; Dreher et al., 2008 and d'Aiglepierre and Wagner, 2013). In the most favourable scenario, a one per cent increase in aid per capita increases completion rates in the next year with 0.026 percentage points. Based on the structural panel, a one per cent increase in aid per capita increases primary enrolment rates with 0.0104 percentage points.

5.2 Secondary education

Table 2 present the estimated effect of aid for secondary education on secondary net enrolment rates and lower-secondary completion rates.

The first two specifications predict that aid positively influences the enrolment rates and negatively affects the completion rates. Aid has a positive effect both on enrolment and

completion rates in the next year. The structural panel also estimates a positive effect on both variables.

The specifications carried out using system GMM estimate a positive effect of aid for secondary education on enrolment rates in the same year and a negative effect on enrolment in the next year.[5] The opposite is true for completion rates. The estimated effect on enrolment rates is smaller than predicted by the fixed effect model. The effect on completion rates is larger. Because of these opposite effects, it is not clear whether the results from the fixed effect model are biased because of reverse causality.

Table 2 – Secondary education

	FE: Annual observations 2002-2016		**FE: 3-year averages**		**System GMM (annual observations)**	
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Aid secondary per capita	0.4987	-0.4915	1.2617**	0.1612	0.1881	-0.0546
	(0.3489)	(0.5853)	(0.4743)	(1.2223)	(0.3257)	(0.6696)
Ln lag Aid secondary per capita	0.5050**	0.3226			-0.0950	0.6599
	(0.1947)	(0.5421)			(0.2964)	(0.5067)
Adjusted R2	0.892	0.676	0.961	0.868		
AR(2) (Prob > z)					0.8373	0.3721
Sargan (Prob > chi2)					0.8701	0.8590
Observations	92	123	63	84	72	123
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) and (6). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (3) and (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (5) and (6) the dependent variable and the explanatory variable aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

When only the lag of aid is included in the model, the coefficients estimated by the fixed effect model stay stable. The effect of the lag of aid on completion rates estimated using the system GMM becomes weaker.

Most of the control variables do not have a significant effect on secondary educational outcomes. Only when a country is classified as democratically free, this positively influences

[5] The specification with enrolment rates as dependent variable includes two lags of the dependent variable as instrument. When only one lag is included aid is dropped from the model because of multicollinearity. For the other specifications one lag is included because this is preferred with respect to the number of observations.

completion rates. The democratic status of a country seems to be more important in improving the educational outcomes of secondary education than in primary education.

Based on the most favourable scenario, the structural panel predicts that a one per cent increase in secondary education aid per capita increases secondary enrolment rates with 0.0126 percentage points. Lower-secondary completion rates increases by 0.007 percentage points as a result of a one per cent increase in secondary education aid per capita in the previous year. The magnitude of these effects corresponds somewhat to the effect that is found for primary education. This result is in accordance with the findings of Michaelowa and Weber (2008), who estimated a similar effect of aid on primary- and secondary educational outcomes.

5.3 Tertiary education

Table 3 presents the estimated effect of aid for higher education on tertiary gross enrolment rates. The first specification estimates a positive effect of aid on enrolment rates in the same year, but a negative effect on enrolment in the next year. The structural panel also estimates a negative effect of aid.

Table 3 – Tertiary education

FE: Annual observations 2002-2016		**FE: 3-year averages**	**System GMM (annual observations)**
Dependent variable:	tGER (%)	tGER (%)	tGER (%)
	(1)	(2)	(3)
Ln Aid tertiary per capita	0.2394	-0.4607	-0.1917
	(0.3445)	(0.4597)	(0.4941)
Ln lag Aid tertiary per capita	-0.3129		0.6322
	(0.3727)		(0.7748)
Adjusted R2	0.751	0.902	
AR(2) (Prob > z)			0.3931
Sargan (Prob > chi2)			0.0026
Observations	181	89	181
Controls	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) the dependent variable and the explanatory variable aid tertiary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Using system GMM, an opposite effect is obtained compared to the fixed effect model. A possible reason for these ambiguous results is that a year's delay in aid and 3-year averages are not suitable time periods to study the effect of aid on tertiary educational performance. This idea is supported by the findings of Michaelowa and Weber (2008), who have only found a positive effect of aid on tertiary enrolment rates in the long-term.

When only the lag of aid is included in the model, the effect estimated by the fixed effect model stays stable, but the effect estimated using system GMM loses in magnitude.

Regarding the control variables, GDP per capita based on purchasing power parity has a significant positive effect on tertiary enrolment rates. In one specification, a positive and significant effect is also estimated for secondary enrolment rates. These results indicate that the resources of a family are more critical in the choice to go to secondary- and tertiary education than for primary education. This may also explain that aid is less important in increasing tertiary gross enrolment rates.

5.4 Robustness checks

The robustness checks are carried out using the preferred estimation strategy, specifically the fixed effect analysis based on the structural panel and the system GMM. The use of these specifications is consistent with the methods applied by previous studies, making a comparison of the results more useful. Moreover, system GMM controls for possible endogeneity problems, which leads to more reliable results. The fixed effect analysis using 3-year averages is preferable because it is more suitable to estimate the effect of structural variables. Besides that, it is expected that aid has a middle to long-term effect which can best be uncovered by the structural panel.

5.4.1 Government expenditure on education

Before proceeding with the various robustness checks, government expenditure on education is added on the right-hand side of the preferred specifications to assess whether the variable should be included as a control. Since government expenditure is not unlikely to affect educational outcomes, an exclusion potentially leads to omitted variable bias. However, most of the studies discussed in chapter 2 did not find a significant impact of public spending on educational outcomes. If government expenditure on education does not have a significant impact, it is preferable to keep the variable out of the model because missing data leads to a

large loss of observations. In addition, it is possible that part of the educational support is accounted for in the aid flows and in the government expenditures.

The preferred specifications are estimated with and without government expenditure on education in the model. The results are found back in the appendix.
When government expenditure is added as an explanatory variable, the effect of aid on primary educational outcomes only slightly changes. Solely the effect of aid on primary completion rates estimated by the structural panel switch sign to a negative effect. Nevertheless, the change in magnitude is small, and the coefficients are not significant. Neither the government expenditures have a significant effect on primary educational outcomes.

For secondary education, the coefficients of aid in the first six specifications increase slightly when government expenditure is included. Again, the effect of government spending itself is not significant. Only in the last specification, the change in the coefficient of aid and lag aid is more severe. This is also the only specification that reports a significant negative effect of government spending. These results are consistent with the study performed by Michaelowa and Weber (2008), which found only a significant effect of government spending on secondary educational outcomes.

The effect of aid on tertiary enrolment rates estimated by the structural panel increases when government expenditure is added to the specification. Using system GMM, the coefficient of aid changes sign. Nevertheless, the effect of government expenditure itself is not significant.

Despite the somewhat ambiguous results obtained when government expenditure is included in the analysis, it is preferable to carry out the robustness checks without adding the variable to the specifications. Usually, the effect of government spending is not significant. The one specification in which the coefficient is significant, the effect is negative, which leads to a downward bias of the effect of aid. Moreover, the results become more reliable when government expenditure is excluded, because of the increase in observations.

5.4.2 Heterogeneity of aid recipients

To research whether the economic development of countries is important in translating education aid to an increase in educational outcomes, the effect of aid is estimated separately on a sample including low-income countries and a sample including lower-middle-income countries. Due to a lack of observations for low-income countries, the results could not be

estimated for each specification. If this is the case, the fields in the table are left blank. In addition, the tests that are performed to indicate whether system GMM is a suitable method, yield less promising statistics in some specifications. These limitations must be taken into account when the results are interpreted.

In table A12 the results for primary education are presented. The estimated effect of aid is higher in low-income countries relative to lower-middle-income countries. The results also indicate a stronger effect of aid than estimated in the main analysis. The outcomes confirm the importance of taking into account the heterogeneity of aid recipients. The results are in line with the study of Asiedu and Nandwa (2007) who find that aid for primary education is most beneficial in low-income countries.

In table A13 the results for secondary education are presented. The structural panel estimates a more positive effect of aid on completion rates in low-income countries. System GMM, however, estimates a higher effect of aid in countries with lower-middle-income. Due to a lack of observation for lower-secondary completion rates and secondary enrolment rates, no firm conclusions can be drawn based on these findings.

For tertiary education, the effect of aid is stronger in lower-middle-income-countries. For low-income countries, the impact of aid even has a negative effect on tertiary gross enrolment rates in the same year. Again, the number of observations is low, especially for the panel with low-income countries. Moreover, the effect measured in lower-middle-income countries is not significant. Nevertheless, the results indicate that it is more beneficial to donate higher education aid to countries with a lower-middle-income relative to countries with a low-income. The results are again in line with Asiedu and Nandwa (2007), who experienced more positive effects from aid to higher education in middle-income countries.

5.4.3 Interaction terms and non-linearity

To understand whether the effect of aid is subjected to diminishing or increasing returns, a squared aid term is included in the model. In table A15-17 the results are presented.

The structural panel estimates a negative coefficient for the squared aid term, meaning that the effect of aid on primary enrolment rates yields diminishing returns. The total effect of aid on enrolment rates is still positive. For primary completion rates, the results suggest increasing returns of aid donations. The opposite effect that is estimated for enrolment and completion rates can be explained by the fact that initial enrolment rates are higher than initial completion

rates. If there is not much room for improvement, the extra dollars donated may be less beneficial.

The results are the reverse for secondary education. The findings suggest that the effect of aid on secondary enrolment rates undergoes an increasing return while the effect on completion rates is somewhat ambiguous. The total effect of aid is positive. This outcome can be explained by the same argument used for primary education. Initial secondary enrolment rates are much lower than initial primary enrolment rates. Nevertheless, the results are only an indication based on the size of the coefficients. No significant effect is obtained.

For tertiary education, the general outcomes indicate diminishing returns of aid donations. Also, the total effect of aid on tertiary enrolment rates is negative in the structural panel, as is the effect of aid in the previous year. This result is also in line with the small effect of aid on tertiary enrolment rates estimated by the main specifications.

The results are partly in line with the results obtained by Michaelowa and Weber (2008), which find diminishing returns of aid for primary- and secondary education. For tertiary education, the estimated effect is insignificant.

Subsequently, an interaction term between aid and the categorical variables Free and Partly Free are included in the analysis (the category Not Free is omitted as a reference group). The variables estimate a possible dependence of the effect of aid on the level of democratic freedom in a country. The results are presented in the tables A18-20.

For primary education, the interaction terms are all positive in the structural panel. If a country is democratically free, a one per cent increase in aid per capita raises primary completion rates by 0.016 percentage points more than when a country is not democratically free. No significant results are obtained using system GMM.

In partly democratic free countries, aid has a larger effect on the increase of lower-secondary enrolment rates. The specification estimated using system GMM suggest that aid yields higher results in countries that are not democratically free. The results for secondary education are based on a small sample for which reason the coefficients are interpreted with caution.

For tertiary education, the structural panel estimates a negative effect of aid on enrolment rates in partly democratic free countries. In democratic free countries, the effect is positive but insignificant. Using system GMM, a positive effect of aid on enrolment rates in countries being not democratically free is estimated. The effect on enrolment rates in the next year is negative for these countries, but positive for countries indicated as democratic free and partly democratic free.

Whether the effect of aid depends on the level of democratic freedom in a country is not clear. Because the democratic status of a country is a structural variable that slowly changes over time, a longer data panel would be more efficient in the study of the effect. Unfortunately, it is not possible to create a more extended data panel when only the desired aid data is used. For this reason, no clear conclusion can be drawn about the dependence of the effect of aid on the democratic status of a country.

5.4.4 Remaining robustness checks

In this section, the results of the remaining robustness checks are discussed. All the robustness checks are carried out using the preferred main specifications from section 5.1, 5.2 and 5.3. The results are presented in the tables A21-23.

First, GDP per capita is included instead of GDP per capita adjusted for purchasing power parity. GDP per capita is a better indicator of the resources obtained by the country well GDP per capita PPP better reflects the resources of households. For all three levels of education, the results stay stable when GDP per capita is included as a control.

Secondly, education aid is not measured per capita but divided by the total population younger than 15 years old to account for the number of people for whom aid is intended. For primary- and tertiary education, again the results stay the same. For secondary education, the results stay stable in the structural panel. Using system GMM the effect of aid on enrolment rates increases in magnitude. The effect of aid on enrolment in the same year becomes more negative and significant at the 5 per cent level. The effect of aid on enrolment in the next year is positive and stronger. The positive result found for the lag of aid is in line with the positive result estimated by the structural panel, indicating that aid influences the enrolment rates in the middle- to long-run.

Thirdly, the overarching types of aid for basic education-, total secondary education- and post-secondary education are used. Here, too, the results remain stable for primary education, indicating that there are no spillover effects from the other types of aid that are part of aid for basic education. For secondary education, the effect of aid loses in strength and magnitude using the structural panel. Using system GMM, the effect of aid on enrolment rates in the next year becomes positive and significant. The effect on completion rates decreases a bit. The results indicate that total aid for secondary education, which also includes aid for vocational training, especially benefits enrolment rates but does not benefit completion rates. An

explanation may be that assistance for vocational training affects the decision to go to secondary school, but it does not affect the decision to complete school. Another possible reason for the lower effect on completion rates is that aid needs more time than three years to produce positive effects on completion rates.
For tertiary education, the results stay stable using the structural panel. However, they switch sign using system GMM. A reason for this may be that aid for higher education especially benefits enrolment rates in the middle- to long-run. While aid for post-secondary education already affects enrolment in the short-run. However, the results are ambiguous because in the structural panel a negative effect of both aid for higher education and aid for post-secondary education is estimated.

At last, child mortality is included as a control variable. The data is extracted from the WDI from the World Bank. It is likely that health influences educational outcomes because it is an important contribution to the ability of children to enrol or complete school. Nevertheless, most of the earlier studies do not control for this variable. When the variable is controlled for, the results stay stable. There are only some coefficients that change in magnitude. Child mortality exclusively has a significant negative influence on secondary educational outcomes.

Based on the results discussed in this section, the overall impact of education aid appears to be positive for improving primary- and lower-secondary completion rates. The effect on primary-, secondary- and tertiary enrolment rates differs per specification. Unfortunately, the results do not seem to be robust for several sensitivity checks. The magnitude, the significance and the sign of the coefficients depend on the model and specification applied. Previous studies encountered the same sensitivity of their results.

6. Conclusion

In this thesis, the effect of education aid on educational outcomes is estimated. The majority of the literature related to this topic followed the goals formulated by the second MDG and estimated the effect of primary education aid on primary net enrolment or completion rates. The overall conclusion of these studies is that there is a small, but non-negligible, positive effect of aid on primary educational outcomes. Their main statement is that the increasing amounts of aid donated to primary education in developing countries have contributed to the increase in enrolment rates. However, to achieve universal primary education, the amounts of aid must increase.

In this study, the previous literature is followed on the grounds of the methodology and data applied. Additionally, the studied period is more recent, making it possible to use only disbursement data from 2002 that are the most reliable and complete. Secondly, this study not only focuses on primary education, but also on the study of the effect of aid for secondary and tertiary educational outcomes. The main findings are similar to those found in the previous literature. Despite the low estimated effect, the general conclusion is that aid for primary education positively influences primary educational outcomes. The effect of aid for secondary education yields positive results as well. However, the results for secondary education should be interpreted with more caution due to less availability of data. The effect of aid on tertiary gross enrolment rates depends per specification and is mostly insignificant.
Further, the effect of aid is estimated separately for low- and lower-middle-income countries. The results indicate that in low-income countries the effect of aid for primary education is the highest. Aid for higher education is most beneficial if it is donated to lower-middle-income countries.

These obtained results are not assumed to be causal due to several inconsistencies in the estimation strategy. First, the models used are not suitable for completely removing the bias caused by reverse causality. For this reason, the actual effect of aid is expected to be higher. Secondly, reliable data on aid disbursement is only available since 2002. Because of the limitation in the length of the data panel, it is difficult to study the effect of more structural variables and the potential long-term effect of aid. An example of such a structural variable is the democratic status of a country of which the estimated effect in this study is not robust. Thirdly, data on educational outcomes is not complete, especially for developing countries, which resulted in a high share of lower-middle-income-countries in the sample compared to low-income countries. This selection bias of relatively more developed countries can also result in a distortion of the results.

At last, it can be beneficial to assess the methodology performed by most studies critically. The main findings from previous studies are alike, which can be explained by the similar applied methods. Ideally, a suitable instrument is introduced that would circumvent the bias caused by endogeneity issues. Unfortunately, such an instrument has not yet been found, and the instruments used so far are not valid. Secondly, a discussion of possibly omitted variables can be insightful. For example, conflicts or natural disasters potentially affect both the flows of educational assistance and educational outcomes.

The focus of this thesis is to estimate the effect of education aid on educational outcomes using better and more disaggregated aid data. It is decided to follow the methodology of previous studies to conclude whether the use of this data would influence the outcomes. For this reason, a comprehensive critical assessment of the methodology is not included. Now that the results of this study do not differ from earlier studies, it may be worthwhile to re-examine the methods applied in future studies.

Appendix

A1 - Country sample

Country	Class	EDI index
Afghanistan	L	
Armenia	LM	
Bangladesh	LM	0.777995
Benin	L	0.640967
Bhutan	LM	0.815253
Bolivia	LM	0.920709
Burkina Faso	L	0.634929
Burundi	L	0.809817
Cabo Verde	LM	0.915682
Cambodia	LM	
Cameroon	LM	0.815522
Central African Republic	L	0.558733
Chad	L	0.520086
Comoros	L	
Congo, Dem. Rep.	L	
Congo, Rep.	LM	
Côte d'Ivoire	LM	
Djibouti	LM	
Egypt, Arab Rep.	LM	
El Salvador	LM	0.909031
Eritrea	L	0.635112
Ethiopia	L	
Gambia, The	L	0.746481
Georgia	UP	
Ghana	LM	0.846564
Guatemala	LM	0.849998
Guinea	L	
Honduras	LM	0.870166
India	LM	
Indonesia	LM	0.936601
Kenya	LM	
Kiribati	LM	
Kyrgyz Republic	LM	
Lao PDR	LM	
Lesotho	LM	0.790809
Liberia	L	
Madagascar	L	
Malawi	L	
Mali	L	0.624736
Mauritania	LM	
Micronesia, Fed. Sts.	LM	
Moldova	LM	
Mongolia	LM	
Morocco	LM	0.863805
Mozambique	L	0.658812
Myanmar	LM	
Nepal	L	0.73919
Nicaragua	LM	
Niger	L	0.534165
Nigeria	LM	0.713664

Pakistan	LM	0.653797
Papua New Guinea	LM	
Philippines	LM	
Rwanda	L	0.776664
Samoa	LM	
São Tomé and Principe	LM	0.832856
Senegal	L	0.715806
Sierra Leone	L	
Solomon Islands	LM	
Somalia	L	
Sri Lanka	LM	0.946725
Sudan	LM	0.728309
Swaziland	LM	0.82527
Syrian Arab Republic	LM	0.929632
Tajikistan	LM	
Tanzania	L	
Timor-Leste	LM	0.816063
Togo	L	
Tonga	LM	
Tunisia	LM	0.918523
Uganda	L	
Ukraine	LM	
Uzbekistan	LM	
Vanuatu	LM	
Vietnam	LM	
West Bank and Gaza	LM	
Yemen, Rep.	LM	
Zambia	LM	
Zimbabwe	L	

Source: EDI (2015) and World Bank (2016).

A2 - Definitions and summary statistics

Variable	*Description*	*Observations*	*Mean*	*Min*	*Max*
Aid to primary education	Aid to primary education disbursed in constant Million US$ 2016 plus 50% of aid to education, level unspecified (OECD DAC, CRS code: 11220 + 50% of 111)	1206	33.621	.176	543.256
Aid to secondary education	Aid to secondary education disbursed in constant Million US$ 2016 plus 20% of aid to education, level unspecified (OECD DAC, CRS code: 11320 + 20% of 111)	1099	8.707	.019	302.458
Aid to higher education	Aid to higher education disbursed in constant Million US$ 2016 plus 30% of aid to education, level unspecified (OECD DAC, CRS code: 11420 + 30% of 111)	1219	24.560	.063	255.811
Primary completion rate	The number of new entrants (enrollments minus repeaters) in the last grade of primary education, regardless of age, divided by the population at the entrance age for the last grade of primary education. (WDI, World Bank, 2017)	822	75.652	20.465	100
Lower Secondary completion rate	The number of new entrants in the last grade of lower secondary education, regardless of age, divided by the population at the entrance age for the last grade of lower secondary education. (WDI, World Bank, 2017)	741	54.491	4.497	100
NER primary	The ratio of children of official school age who are enrolled in school to the population of the corresponding official school age. (WDI, World Bank, 2017)	749	81.664	31.033	99.925
NER lower-secondary	Net enrollment rate is the ratio of children of official school age who are enrolled in school to the population of the corresponding official school age. (WDI, World Bank, 2017)	510	47.995	4.072	95.503
GER Tertiary	The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.	728	16.496	.407	83.422
GEXPED	Public spending on education (% of government expenditure). (EdStas, World Bank, 2017)	622	16.564	4.771	44.802

PTR primary	The average number of pupils per teacher in primary school. (WDI, World Bank, 2017)	850	36.271	8.680	100.237
PTR secondary	The average number of pupils per teacher in secondary school. (WDI, World Bank, 2017)	569	23.862	6.970	80.052
PTR tertiary	The average number of pupils per teacher in tertiary school. (WDI, World Bank, 2017)	531	20.012	5.451	147.56
GDP per capita PPP	GDP per capita based on purchasing power parity (PPP). Data are in constant 2011 international dollars. (WDI, World Bank, 2017)	1179	3462.366	503.832	11417.26
YOUNG POP	Population aged 0–14 (% of total population). (WDI, World Bank, 2017)	1210	38.417	14.104	50.231
URBAN	Urban population (% of total). (WDI, World Bank, 2017)	1210	38.455	8.682	77.43
INFLATION	Inflation, consumer prices (annual %). (WDI, World Bank, 2017)	1131	30.435	-35.837	24411.03
OPEN	The sum of exports and imports of goods and services measured in % of GDP. (WDI, World Bank, 2017)	1129	77.052	.167	311.355
BUDGET	Cash surplus/deficit (% of GDP). (WDI, World Bank, 2017)	469	-1.469	-17.983	128.111
FREE	The Freedom House Index. (Freedom House, 2017).	1208	2.310	1	3

Table A3 – Primary education

	FE: annual observations 2002-2016		**FE: 3-year averages**		**System GMM (annual observations)**	
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Aid primary per capita	0.8930*	-1.9861***	1.0377**	0.1251	0.1622	-1.1566
	(0.4486)	(0.6382)	(0.4345)	(0.5681)	(0.5630)	(0.8514)
Ln lag Aid primary per capita	-0.4371	2.2499***			-0.3853	2.6060***
	(0.4979)	(0.8013)			(0.5782)	(0.8025)
Lag Dependent variable	0.5972***	0.5793***	0.9649***	0.9375***	0.7735***	0.7011***
	(0.0915)	(0.0647)	(0.0404)	(0.0542)	(0.0924)	(0.1024)
PTR primary	0.1981***	0.1808	-0.0479	0.3770***	-0.0188	-0.0931

	(0.0665)	(0.1335)	(0.0929)	(0.1343)	(0.0656)	(0.1108)
GDP capita PPP	-0.0006	-0.0005	0.0002	-0.0002	0.0003	0.0005
	(0.0004)	(0.0007)	(0.0003)	(0.0004)	(0.0005)	(0.0007)
Population under 15	0.0865	-0.6968*	0.1457	-0.0242	-0.1955	-0.0675
	(0.3423)	(0.3650)	(0.1733)	(0.3268)	(0.1634)	(0.2238)
Urban population	0.7327**	0.7169**	-0.0840	0.2519	-0.0682	0.1623
	(0.3027)	(0.3365)	(0.1066)	(0.2204)	(0.0735)	(0.1044)
Inflation	-0.0017	0.0790	0.1730	0.1161	-0.0470	0.1441
	(0.0475)	(0.0655)	(0.1080)	(0.1181)	(0.0691)	(0.0931)
Openness	-0.0104	0.0536	-0.0233*	-0.0315	-0.0024	0.0217
	(0.0213)	(0.0339)	(0.0134)	(0.0289)	(0.0251)	(0.0339)
Budget	0.0124	-0.0520	0.2632***	-0.2659	-0.0067	-0.0552
	(0.0430)	(0.0548)	(0.0911)	(0.1631)	(0.0514)	(0.0715)
Free	-1.1937	-0.0224	-1.0503	0.4332	1.5880	-2.0989
	(1.2648)	(1.5500)	(1.3215)	(1.9178)	(1.8156)	(3.0367)
Partly Free	-0.7499	-0.5907	-1.2648	0.0541	0.7413	-3.1928
	(0.9295)	(0.9027)	(0.9442)	(1.4693)	(1.0708)	(2.5747)
AR(2) (Prob > z)					0.7424	0.7130
Sargan (Prob > chi2)					0.1902	0.1279
Adjusted R2	0.733	0.692	0.905	0.925		
Observations	222	243	110	127	222	243

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) and (6). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (3) and (4) are all averaged over 3 years and the dependent variable of the last year of each period is included. In (5) and (6) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A4 – Primary education, only lag Aid included

	FE: annual observations 2002-2016		**System GMM**	
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)
Ln lag Aid primary per capita	-0.1783	1.4489**	-0.5330	3.3807**
	(0.4783)	(0.6702)	(0.4383)	(1.0460)
AR(2) (Prob > z)			0.7385	0.5757
Sargan (Prob > chi2)			0.41752	0.4163
Adjusted R2	0.724	0.676		
Observations	223	244	200	218

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms.

In (3) and (4) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A5 – Secondary education

	FE: annual observations 2002-2016		**FE: 3-year averages**		**System GMM (annual observations)**	
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Ln Aid secondary per capita	0.4987	-0.4915	1.2617**	0.1612	0.1881	-0.0546
	(0.3489)	(0.5853)	(0.4743)	(1.2223)	(0.3257)	(0.6696)
Ln lag Aid secondary per capita	0.5050**	0.3226			-0.0950	0.6599
	(0.1947)	(0.5421)			(0.2964)	(0.5067)
Lag Dependent variable	0.6393***	0.5938***	0.6920***	0.9844***	0.9067***	0.7399***
	(0.0847)	(0.1030)	(0.1102)	(0.1044)	(0.1271)	(0.0731)
PTR secondary	0.1291	0.2701	0.0540	0.0093	-0.0376	0.5070***
	(0.0931)	(0.1994)	(0.0554)	(0.1557)	(0.0688)	(0.1447)
GDP capita PPP	-0.0007	0.0003	0.0002	-0.0006	0.0011**	0.0003
	(0.0011)	(0.0012)	(0.0007)	(0.0008)	(0.0005)	(0.0006)
Population under 15	0.0641	-0.3644	-0.1371	-0.7336	0.1033	-0.8825***
	(0.3627)	(0.5217)	(0.2689)	(0.4599)	(0.0937)	(0.2738)
Urban population	0.8951***	0.0143	0.5357**	0.2078	-0.0715	-0.0458
	(0.2722)	(0.3147)	(0.2162)	(0.3380)	(0.1054)	(0.1275)
Inflation	0.0393	0.2412*	0.4928***	0.2402	0.0407	0.2627**
	(0.0782)	(0.1215)	(0.1724)	(0.1863)	(0.0735)	(0.1238)
Openness	-0.0385	0.0570	-0.0031	0.0301	0.0163	-0.0008
	(0.0337)	(0.0438)	(0.0278)	(0.0420)	(0.0263)	(0.0381)
Budget	0.2258	-0.1148	-0.0045	-0.2925	0.0238	-0.0398
	(0.1719)	(0.1687)	(0.1261)	(0.2219)	(0.1746)	(0.1852)
Free	3.1300*	5.1340*	-1.2367	5.6286*	5.3250	10.0572***
	(1.6682)	(2.6589)	(0.8661)	(2.9379)	(4.4288)	(3.5458)
Partly Free	2.0910	0.6926	-1.0831	0.4774	4.7937	-0.0064
	(1.2681)	(2.3359)	(1.3091)	(1.5384)	(4.2187)	(2.1971)
AR(2) (Prob > z)					0.8373	0.3721
Sargan (Prob > chi2)					0.8701	0.8590
Adjusted R2	0.892	0.676	0.961	0.868		
Observations	92	123	63	84	72	123

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) and (6). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (3) and (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (5) and (6) the dependent variable and the explanatory variable aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A6 – Secondary education, only lag Aid included

	FE: annual observations 2002-2016		**System GMM**	
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)
Ln lag Aid secondary per capita	0.4852**	0.3120	-0.0387	0.1272
	(0.1869)	(0.4461)	(0.2493)	(0.6693)
AR(2) (Prob > z)			0.4130	0.2698
Sargan (Prob > chi2)			0.9785	0.9616
Adjusted R2	0.890	0.657		
Observations	92	124	70	111

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms.
In (3) and (4) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A7 – Tertiary education

	FE: annual observations 2002-2016	**FE: 3-year averages**	**System GMM (annual observations)**
Dependent variable:	tGER (%)	tGER (%)	tGER (%)
	(1)	(2)	(3)
Ln Aid tertiary per capita	0.2394	-0.4607	-0.1917
	(0.3445)	(0.4597)	(0.4941)
Ln lag Aid tertiary per capita	-0.3129		0.6322
	(0.3727)		(0.7748)
Lag Dependent variable	0.7530***	0.8855***	0.9167***
	(0.0512)	(0.0549)	(0.0426)
PTR tertiary	0.0911**	0.0297	0.1147
	(0.0380)	(0.0252)	(0.0708)
GDP capita PPP	0.0007***	0.0007*	0.0003*
	(0.0002)	(0.0004)	(0.0002)
Population under 15	-0.0421	0.0059	-0.2290**
	(0.2057)	(0.1940)	(0.0913)

Urban population	0.2271*	0.0722	-0.0988*
	(0.1182)	(0.1588)	(0.0584)
Inflation	0.0300	-0.0707	0.0530
	(0.0224)	(0.1118)	(0.0457)
Openness	-0.0182	0.0028	0.0190*
	(0.0146)	(0.0307)	(0.0102)
Budget	0.0697	-0.2324	0.1795*
	(0.1150)	(0.1433)	(0.0984)
Free	0.8271	2.6278	1.3258*
	(0.6363)	(2.2021)	(0.7261)
Partly Free	0.3823	0.2346	-0.1023
	(0.4216)	(1.2368)	(0.9857)
AR(2) (Prob > z)			0.3931
Sargan (Prob > chi2)			0.0026
Adjusted R2	0.751	0.902	
Observations	181	89	181

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) and (6). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (3) and (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (5) and (6) the dependent variable and the explanatory variable aid tertiary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A8 – Tertiary education, only lag Aid included

	FE: annual observations 2002-2016	**System GMM**
Dependent variable:	tGER (%)	tGER (%)
	(1)	(2)
Ln lag Aid tertiary per capita	-0.2676	0.3263
	(0.3387)	(0.4563)
AR(2) (Prob > z)		0.5106
Sargan (Prob > chi2)		0.1068
Adjusted R2	0.752	
Observations	181	163

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (2). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms.
In (2) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A9 – Primary education government expenditure on education included

	FE: 3-year averages				System GMM			
Dependent variable:	pNER (%)	pNER (%)	pComp (%)	pComp (%)	pNER (%)	pNER (%)	pComp (%)	pComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid primary per capita	1.0377**	1.0554*	0.1251	-0.2161	0.1622	0.3301	-1.1566	-1.9350***
	(0.4345)	(0.5770)	(0.5681)	(0.6099)	(0.5630)	(0.6636)	(0.8514)	(0.7050)
Ln lag Aid primary per capita					-0.3853	-0.3363	2.6060***	1.4425*
					(0.5782)	(0.6240)	(0.8025)	(0.7602)
GEXPED		0.0821		0.1037		-0.0634		-0.0264
		(0.1127)		(0.0709)		(0.1085)		(0.1591)
Adjusted R2	0.905	0.873	0.925					
AR(2) (Prob > z)					0.7424	0.5864	0.7130	0.9221
Sargan (Prob > chi2)					0.1902	0.2738	0.1279	0.7628
Observations	110	90	127	106	222	137	243	116
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) till (8). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) till (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (5) till (8) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A10 – Secondary education government expenditure on education included

	FE: 3-year averages				System GMM			
Dependent variable:	sNER (%)	sNER (%)	lsComp (%)	lsComp (%)	sNER (%)	sNER (%)	lsComp (%)	lsComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid secondary per capita	1.2617**	1.3589**	0.1612	0.4584	0.1881	0.5911	-0.0546	0.2160
	(0.4743)	(0.5203)	(1.2223)	(1.1922)	(0.3257)	(0.7246)	(0.6696)	(0.5741)
Ln lag Aid secondary per capita					-0.0950	-0.4674	0.6599	-0.0303
					(0.2964)	(0.4929)	(0.5067)	(0.7566)
GEXPED		-0.1577		0.0852		-0.1054		-0.2194*
		(0.1619)		(0.2921)		(0.0990)		(0.1246)
Adjusted R2	0.961	0.966	0.868	0.871				
AR(2) (Prob > z)					0.8373	0.2117	0.3721	0.3381
Sargan (Prob > chi2)					0.8701	1.0000	0.8590	0.9979
Observations	63	56	84	74	72	54	123	87
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (5) till (8). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) till (4) are all averaged over 3 years and the dependent variable of the last year of each period is included.

In (5) till (8) the dependent variable and the explanatory variable aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A11 – Tertiary education government expenditure on education included

	FE: 3-year averages		**System GMM**	
Dependent variable:	tGER (%)	tGER (%)	tGER (%)	tGER (%)
	(1)	(2)	(3)	(4)
Ln Aid tertiary per capita	-0.4607	-1.1168	-0.1917	0.1561
	(0.4597)	(0.8084)	(0.4941)	(0.6630)
Ln lag Aid tertiary per capita			0.6322	-0.4122
			(0.7748)	(0.9538)
GEXPED		0.0726		-0.0611
		(0.1116)		(0.1407)
Adjusted R2	0.902	0.893		
AR(2) (Prob > z)			0.3931	0.3952
Sargan (Prob > chi2)			0.0026	0.3850
Observations	89	78	181	122
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). Year dummies are included in every specification. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A12 - Primary education split sample

	FE: 3-year averages		**System GMM**	
Panel A: Low-income countries				
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita		3.4093*** (1.0661)	-2.4109*** (0.7667)	-3.1099** (1.3339)
Ln lag Aid primary per capita			2.2037* (1.1560)	3.6459*** (0.9127)
AR(2) (Prob > z)			0.1761	0.3458
Sargan (Prob > chi2)			0.9999	0.9805
Adjusted R2		0.973		
Observations		36	49	71
Controls	Yes	Yes	Yes	Yes

Panel B: Lower-middle-income countries				
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita	1.1578*** (0.4208)	0.5010 (0.6719)	0.7882** (0.3764)	-1.4629* (0.8134)
Ln lag Aid primary per capita			-0.4752 (0.3849)	2.9916*** (0.8764)
AR(2) (Prob > z)			0.1740	0.2511
Sargan (Prob > chi2)			0.6541	0.5433
Adjusted R2	0.855	0.911		
Observations	87	91	173	172
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A13 - Secondary education split sample

	FE: 3-year averages		**System GMM**	
Panel A – Low-income countries				
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita		1.1864*** (0.000)		0.3291 (0.2759)
Ln lag Aid primary per capita				1.6631*** (0.4741)
AR(2) (Prob > z)				0.3224
Sargan (Prob > chi2)				1.000
Adjusted R2		1.000		
Observations		21		30
Controls		Yes		Yes
Panel B – Lower-middle-income countries				
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita	1.5358** (0.6770)	0.4460 (1.4444)	-0.2440 (0.4734)	-0.3334 (0.7334)
Ln lag Aid primary per capita			-0.2247 (0.4328)	2.2720*** (0.7936)

AR(2) (Prob > z)			0.7410	0.9638
Sargan (Prob > chi2)			0.8752	0.9718
Adjusted R2	0.955	0.857		
Observations	47	63	57	59
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A14 - Tertiary education split sample

	FE: 3-year averages	**System GMM**
Panel A: Low-income countries		
Dependent variable:	tGER (%)	tGER (%)
	(1)	(2)
Ln Aid tertiary per capita	0.1367 (.)	-0.7904* (0.4167)
Ln lag Aid tertiary per capita		0.3045 (0.4514)
AR(2) (Prob > z)		0.1236
Sargan (Prob > chi2)		1.000
Adjusted R2	1.000	
Observations	25	43
Controls	Yes	Yes
Panel B: Lower-middle-income countries		
Dependent variable:	tGER (%)	tGER (%)
	(1)	(2)
Ln Aid tertiary per capita	-0.1030 (0.8094)	0.2888 (0.5834)
Ln lag Aid tertiary per capita		0.7491 (0.4918)
AR(2) (Prob > z)		0.2281
Sargan (Prob > chi2)		0.0963
Adjusted R2	0.905	
Observations	64	138
Controls	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (2). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) are all averaged over 3 years and the dependent variable of the last year of each period is included.

In (2) the dependent variable and the explanatory variable aid tertiary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A15 - Primary education non-linearity

	FE: 3-year averages		**System GMM**	
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita	0.8332*	0.2768	0.5189	-1.1858
	(0.4491)	(0.6062)	(0.5786)	(0.8977)
Ln lag Aid primary per capita			-0.4532	2.2862***
			(0.5437)	(0.7986)
Ln squared Aid primary per capita	-0.1653	0.1813*	0.1479	-0.3007
	(0.0986)	(0.1032)	(0.1349)	(0.3930)
Ln squared lag Aid primary per capita			-0.3742**	0.1709
			(0.1580)	(0.3436)
Adjusted R2	0.906	0.925		
AR(2) (Prob > z)			0.8964	0.7170
Sargan (Prob > chi2)			0.5723	0.4920
Observations	110	127	222	243
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid primary and squared aid primary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A16 - Secondary education non-linearity

	FE: 3-year averages		**System GMM**	
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)
Ln Aid secondary per capita	1.0755**	0.3385	0.3032	0.4328
	(0.4778)	(1.3404)	(0.3058)	(0.7736)
Ln lag Aid secondary per capita			0.2648	0.2282
			(0.4329)	(0.6719)
Ln squared Aid secondary per capita	0.0283	-0.0223	0.1395	0.2409
	(0.0331)	(0.0495)	(0.1853)	(0.1820)
Ln squared lag Aid secondary per capita			0.1514	-0.2451

			(0.1583)	(0.1905)
Adjusted R2	0.961	0.867		
AR(2) (Prob > z)			0.6337	0.2082
Sargan (Prob > chi2)			0.9637	0.9324
Observations	63	84	72	123
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid secondary and squared aid secondary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A17 - Tertiary education non-linearity

	FE: 3-year averages	**System GMM**
Dependent variable:	tGER (%)	tGER (%)
	(1)	(2)
Ln Aid tertiary per capita	-0.7529	-0.3385
	(0.4961)	(0.4977)
Ln lag Aid tertiary per capita		0.6057
		(0.4457)
Ln squared Aid tertiary per capita	-0.6594***	0.2862**
	(0.2099)	(0.1357)
Ln squared lag Aid tertiary per capita		-0.4155**
		(0.1730)
Adjusted R2	0.911	
AR(2) (Prob > z)		0.5699
Sargan (Prob > chi2)		0.0501
Observations	89	181
Controls	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (2). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (2) the dependent variable and the explanatory variable aid tertiary and squared aid tertiary are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A18 - Primary education interaction terms

	FE: 3-year averages		System GMM	
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)
Ln Aid primary per capita	0.3695	-0.8463	1.1318*	-1.6897
	(0.7016)	(0.6106)	(0.6657)	(1.1893)
Ln lag Aid primary per capita			-1.5408	3.1659**
			(1.1075)	(1.3335)
Ln Aid primary*Free	0.6813	1.6131***	-1.1689	-0.3719
	(0.8032)	(0.5469)	(0.8251)	(1.8101)
Ln Aid primary*Partly free	1.0715	0.6012	-1.3014	0.8779
	(0.8119)	(0.5425)	(1.0019)	(1.4304)
Ln lag Aid primary*Free			1.7953	-0.4796
			(1.3330)	(1.8403)
Ln lag Aid primary*Partly free			1.3635	-0.6201
			(1.4316)	(1.2440)
Adjusted R2	0.904	0.927		
AR(2) (Prob > z)			0.8441	0.6747
Sargan (Prob > chi2)			0.6122	0.5705
Observations	110	127	222	243
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid primary and aid interacted with free and partly free are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A19 - Secondary education interaction terms

	FE: 3-year averages		System GMM	
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)
Ln Aid secondary per capita	1.0135	-0.9885	2.0457**	0.5953
	(1.3011)	(0.9438)	(0.9268)	(1.5556)
Ln lag Aid secondary per capita			2.0691***	0.0531
			(0.5284)	(1.3086)
Ln Aid secondary*Free	0.2720	1.9209	-2.0202**	-0.8778
	(1.3781)	(1.6781)	(0.8232)	(1.8040)

Ln Aid secondary*Partly free	0.2499	1.2394*	-1.7098*	-0.4218
	(1.3471)	(0.6990)	(1.0116)	(1.4923)
Ln lag Aid secondary*Free			-2.0321***	1.1183
			(0.5939)	(1.4973)
Ln lag Aid secondary*Partly free			-1.8745***	0.4814
			(0.4906)	(1.2234)
Adjusted R2	0.960	0.871		
AR(2) (Prob > z)			0.5249	0.3097
Sargan (Prob > chi2)			0.9916	0.9477
Observations	63	84	72	123
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (3) and (4). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) and (2) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (3) and (4) the dependent variable and the explanatory variable aid secondary and aid interacted with free and partly free are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A20 - Tertiary education interaction terms

	FE: 3-year averages	**System GMM**
Dependent variable:	tGER (%)	tGER (%)
	(1)	(2)
Ln Aid tertiary per capita	0.2243	0.1661
	(0.5285)	(0.8411)
Ln lag Aid tertiary per capita		-0.7362
		(0.8354)
Ln Aid tertiary*Free	0.9052	-1.1635
	(1.3298)	(0.7479)
Ln Aid tertiary*Partly free	-1.3991***	-0.6580
	(0.4985)	(0.5796)
Ln lag Aid tertiary*Free		2.2552*
		(1.2235)
Ln lag Aid tertiary*Partly free		0.9787**
		(0.4811)
Adjusted R2	0.911	
AR(2) (Prob > z)		0.5833
Sargan (Prob > chi2)		0.1047
Observations	89	181
Controls	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for (2). The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for specifications (1) are all averaged over 3 years and the dependent variable of the last year of each period is included.
In (2) the dependent variable and the explanatory variable aid tertiary and aid interacted with free and partly free are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A21:
Primary education robustness checks FE: 3-year averages

Robustness	GDP capita	GDP capita	Aid/POP young	Aid/POP young	Aid basic	Aid basic	Child mortality	Child mortality
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid primary/basic per capita	1.0362**	0.1146	1.0520**	0.1291	1.0621**	0.0741	0.7566*	-0.3327
	(0.4348)	(0.5661)	(0.4342)	(0.5723)	(0.4392)	(0.6067)	(0.3753)	(0.6805)
Adjusted R2	0.906	0.925	0.905	0.925	0.904	0.925	0.907	0.927
Observations	110	127	110	127	110	127	110	127
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Primary education robustness checks System GMM

Robustness	GDP capita	GDP capita	Aid/POP young	Aid/POP young	Aid basic	Aid basic	Child mortality	Child mortality
Dependent variable:	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)	pNER (%)	pComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid primary/basic per capita	0.1566	-1.1780	0.1742	-1.1552	0.2021	-1.2983	0.3719	-1.0948
	(0.5688)	(0.8717)	(0.5628)	(0.8522)	(0.5870)	(0.8730)	(0.5830)	(0.8338)
Ln lag Aid primary/basic per capita	-0.4228	2.6802***	-0.4111	2.4947***	-0.4689	3.0933***	-0.5652	2.5040***
	(0.5833)	(0.8405)	(0.5769)	(0.7846)	(0.6417)	(0.9391)	(0.6280)	(0.8009)
AR(2) (Prob > z)	0.7921	0.6670	0.7368	0.7013	0.9388	0.6856	0.8318	0.7198
Sargan (Prob > chi2)	0.2005	0.1533	0.1944	0.1401	0.1107	0.2736	0.1775	0.1096
Observations	222	243	222	243	225	246	222	243
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for system GMM. The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for the structural panel are all averaged over 3 years and the dependent variable of the last year of each period is included.
Using system GMM the dependent variable and the explanatory variable aid are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A22:

Secondary education robustness checks FE: 3-year averages

Robustness	GDP capita	GDP capita	Aid/POP young	Aid/POP young	Aid total secondary	Aid total secondary	Child mortality	Child mortality
Dependent variable:	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)	sNER (%)	lsComp (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid secondary/total secondary per capita	1.2830***	0.1183	1.2498**	0.1531	0.3244	-1.0065	1.3894***	0.8006
	(0.4241)	(1.2005)	(0.4748)	(1.2277)	(0.7940)	(1.2073)	(0.4371)	(1.1446)
Adjusted R2	0.961	0.869	0.961	0.868	0.951	0.871	0.965	0.890
Observations	63	84	63	84	63	84	63	84
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Secondary education robustness checks System GMM

Robustness	GDP capita	GDP capita	Aid/POP young	Aid/POP young	Aid total secondary	Aid total secondary	Child mortality	Child mortality
Dependent variable:	sNER	lsComp	sNER	lsComp	sNER	lsComp	sNER	lsComp
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Aid secondary/total secondary per capita	0.0697	-0.0474	0.6883	-2.5880*	-0.0813	-0.1907	0.1336	-0.1661
	(0.3707)	(0.6618)	(0.7027)	(1.3478)	(0.3128)	(0.6127)	(0.2898)	(0.6602)
Ln lag Aid secondary/total secondary per capita	-0.2912	0.6467	-0.4614	1.9979	0.4135**	0.4946	-0.4408	0.5390
	(0.2619)	(0.5115)	(0.6786)	(1.2893)	(0.2035)	(0.5915)	(0.3089)	(0.5076)
AR(2) (Prob > z)	0.9102	0.3782	0.6561	0.1550	0.3891	0.3545	0.9782	0.3487
Sargan (Prob > chi2)	0.8706	0.8443	0.9168	0.9493	0.9171	0.9647	0.8945	0.9083
Observations	72	123	74	134	74	132	72	123
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for system GMM. The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for the structural panel are all averaged over 3 years and the dependent variable of the last year of each period is included.
Using system GMM the dependent variable and the explanatory variable aid are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A23:

Tertiary education robustness checks FE: 3-year averages

Robustness	GDP capita	Aid/POP young	Aid post-secondary	Child mortality
Dependent variable:	tGER (%)	tGER (%)	tGER (%)	tGER (%)
	(1)	(2)	(3)	(4)
Ln Aid secondary/post-secondary per capita	-0.4114	-0.5212	-0.4044	-0.3867

	(0.4498)	(0.4631)	(0.4346)	(0.4758)
Adjusted R2	0.901	0.902	0.902	0.902
Observations	89	89	89	89
Controls	Yes	Yes	Yes	Yes
Tertiary education robustness checks system GMM				
Robustness	GDP capita	Aid/POP young	Aid post-secondary	Child mortality
Dependent variable:	tGER (%)	tGER (%)	tGER (%)	tGER (%)
	(1)	(2)	(3)	(4)
Ln Aid higher/post-secondary per capita	-0.1618	-0.1414	0.6339	-0.1960
	(0.5017)	(0.5233)	(0.7810)	(0.5032)
Ln lag Aid higher/post-secondary per capita	0.5957	0.5052	-0.1869	0.6597
	(0.8043)	(0.8234)	(0.4978)	(0.7591)
AR(2) (Prob > z)	0.3775	0.3889	0.4040	0.3770
Sargan (Prob > chi2)	0.0027	0.0016	0.0030	0.0033
Observations	181	181	181	181
Controls	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are adjusted for clusters on the country level and estimated robustly for system GMM. The set of controls is included in every specification as well as year dummies. Aid is measured per capita and in natural logarithms. The explanatory variables for the structural panel are all averaged over 3 years and the dependent variable of the last year of each period is included.
Using system GMM the dependent variable and the explanatory variable aid are considered as endogenous for which the first lag is included as instrument. The other variables are considered strictly exogenous.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

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